

Success Story

DOE-funded Research Leads to Quick Commercialization of Advanced Filtration System

Less dependence on foreign oil, and eventual transition to an emissions-free, petroleum-free vehicle

Background

An innovative new oil filtration system developed with funding from the U.S. Department of Energy's FreedomCAR and Vehicle Technologies Program minimizes the frequency with which heavy-duty trucks undergo oil changes. The new Advanced Filtration System by Engineered Machined Products (EMP), Inc., incorporates high-capacity fine filtering (two-micron filtering) to super-clean engine oil, greatly reducing oil use and saving money for truck owners.

The Technology

The Advanced Filtration System (AFS) is an auxiliary advanced engine filtration system consisting of an electric oil transfer pump, a replaceable/recyclable filtering cartridge, a self-indexing system to continuously advance in clean filtering medium, and a housing to enclose it all. This system operates independently of an engine's main lubrication system and applies a continuous filtering method to the engine oil. The reel-to-reel configuration enables the filtration device to automatically replace used or dirty filtering medium in a controlled and continuous fashion. The AFS provides greatly expanded oil filtering and contaminant retention over a set service interval. As a result, the



The complete Advanced Filtration System from EMP. Much of the research that led to the system's development was performed under a subcontract from Argonne National Laboratory, funded in part by the U.S. Department of Energy's FreedomCAR and Vehicle Technologies Program.

filtering operation can remove the large amount of soot introduced to the lube oil by exhaust gas recirculation (EGR), a pollution-reduction technique used in many heavy-duty truck engines.

The reel-to-reel principle is based upon the monitoring of the pressure differential between the upstream side and the downstream side of the filtering medium. When a high pressure differential exists due to the build-up of particles on the filtering medium, the system sends signals to the transfer pump to cease oil flow to the filter, and to the self-indexing system to advance clean filtering medium to the

oil flow from a supply reel. Simultaneously, the self-indexing system ejects the dirty filtering medium from the oil flow to a take-up reel. The transfer pump then initiates oil flow back through the filtering device. The process repeats until a desirable pressure differential is achieved. When the recommended service interval is reached, the filtering cartridge can be removed and replaced with a new cartridge.

Two key features distinguish the AFS from similar products. First, it uses an electric transfer pump to take fluid from a reservoir and transfer it to the filtration device. This allows the filter

vehicle systems

system to function independently of the system it is protecting. In addition, the pump allows for automated draining and filling of oil during servicing and provides the capability to pre- and post-lube the engine. Second, the system's unique "reel-to-reel" filtering method automatically exchanges used or plugged filtering medium for new or clean filtering medium as needed. This filtering method allows for an unlimited supply of filtering medium as well as more efficient use of the filtering medium.

Commercialization

The research behind the system was performed under a subcontract from Argonne National Laboratory, funded in part by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy, FreedomCAR and Vehicle Technologies Program. The EMP-DOE-Argonne effort was particularly notable for its quick concept-to-commercialization time of less than three years.

Benefits

- Reduces the number of oil changes per year by 66–80%.
- Results in an average per-truck annual savings of \$540–900.
- Could save more than 30 million gallons of lube oil per year across the entire U.S. heavy-duty truck fleet.

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